

NOTES ON SOME NEW OR LITTLE-KNOWN MEMBERS OF THE
FAMILY DORIDIIDÆ.¹

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PLATE XIII.

In the following paper I propose to describe some new or little-known members of the family Doridiidæ, captured on the east coast of Africa and at Rotuma in the South Pacific. The specimens from the latter locality were kindly lent me by Mr. Stanley Gardiner.

The Doridiidæ are Tectibranchia of the subdivision Cephalaspidea, bearing two dorsal shields with a furrow between them. The anterior shield has free margins, but as a rule is not developed into tentacles; the posterior has the margins less developed, but is produced behind into two processes. The foot is broad, truncate before and behind, and continued on each side into a fairly ample parapodium, from which it is not clearly divided. The parapodia are united behind, and the posterior part of the body hangs over or rests on them. Organs analogous to rhinophores are often present in the form of lamellæ under the sides of the head-shield or lumps with bristles around the mouth. The branchia is a large bipinnate plume, posterior and on the right side. Behind it is the vent, in front of it the genital orifice, which is connected by an open groove with the verge on the right anterior extremity of the body. The verge is grooved, the prostate double or single. The shell is wholly internal, posterior, and generally composed of a minute spire with a single solute whorl; sometimes wholly membranous, sometimes partly calcified, rarely wholly calcified. There are no jaws, radula, or stomach plates, but there is, as a rule, a large, sometimes colossal, buccal bulb with thick muscular walls. This, however, is not the case in some of the species here described. Since, however, they are in other respects typical Doridia, and the difference in the digestive tract is one of development, not of structure, it is not necessary to create a new genus for them.

Three genera are recognized—*Doridium*² (Meckel), which has no tentacular appendages to the anterior shield and short posterior processes; *Chelidonura* (Adams), also without tentacular appendages,

¹ See R. BERGH, "Die Gruppe der Doridiiden," Mittheil. Zool. Station Neapel, xi (1893), pp. 107-135: ib., "Reports on the dredging . . . carried on by the . . . Albatross, xiii, Die Opisthobranchien," Bull. Mus. Comp. Zool. Harvard Coll., xxv, No. 10 (1894), pp. 125-233: ib. in Semper's "Reisen im Archipel der Philippinen, Wissensch. Result.," Bd. VII, abth. iv, absch. 2, lief. 1 (1900), p. 177, and absch. 3, lief. 2 (1901), p. 302: ib., "Reise nach dem Pacific (Schausland). Die Opisthobranchier," Zool. Jahrb., xiii, Syst. (1900), p. 211.

² Pilsbry prefers the older name *Aglaja* for *Doridium*.

but having long narrow posterior processes, and usually sense organs in the form of knobs studded with bristles and set round the mouth; *Navarchus*¹ (Cooper), in which the front margin of the anterior shield is developed into rhinophore-like projections. Bergh admits that *Navarchus* is a somewhat doubtful genus, and one of my specimens of *Chelidonura varians* exhibited tentacular projections of the anterior shield which were absent in the other examples. It remains to be seen whether the distinction in shape between *Doridium* and *Chelidonura* is absolute, or whether intermediate forms will be discovered.

DORIDIUM.—About fourteen species seem to be known with more or less certainty, of which two are now described for the first time.

1. *D. tricoloratum* (Renier). Mediterranean.
2. *D. depictum* (Renier). Mediterranean.
3. *D. punctilucens*, Bergh. W. Indies.
4. *D. purpureum*, Bergh. California.
5. *D. cylindricum* (Cheeseman). New Zealand.
6. *D. ocelligerum*, Bergh. N. Pacific.
7. *D. diomedium*, Bergh. N. Pacific.
8. *D. lineolatum* (H. & A. Adams). Pacific.
9. *D. alboventrale*, Bergh. Malay Archipelago.
10. *D. cyaneum*, Martens. E. Africa.
11. *D. obscurum*, Bergh. S. Pacific.
12. *D. Pilsbryi*, Eliot. S. Pacific.
13. *D. Gardineri*, Eliot, n.sp. S. Pacific.
14. *D. reticulatum*, Eliot, n.sp. E. Africa.

DORIDIUM GARDINERI, nov. sp.

Four specimens captured by Mr. Stanley Gardiner at Rotuma. The length of the largest is 51 mm., the breadth 25 mm. The head-shield, which is 23 mm., has ample margins and a free flap behind measuring 6 mm. The edges of the posterior shield are also more distinct than usual. The parapodia are ample, the free part at the sides measuring 11 and that behind 14 mm. The posterior shield is prolonged into two voluminous processes, which do not form a disc but lie like the tails of an evening coat. Each is folded on itself, and thus double. A fleshy prominence proceeds from the left process towards the right, and takes part in covering the gill. The exposed parts of the two larger specimens are of a uniform deep bluish black, and the inside of the parapodia silvery grey. The two smaller specimens (which, however, have the specific characteristics) are brownish and lighter at the sides. Mr. Gardiner's note as to the colour of the living animal is almost obliterated by the action of the alcohol, but appears to read "Black . . . yellow . . . at sides." This may refer to the brownish specimens, or possibly to two distinct yellowish rhinophorial organs situated on the upper part of each side of the head below the edge of the shield. They are about 10 mm. long, and consist of a series of laminae arranged in almost pinnate form, but the central axis is not continuous. The gill is posterior, yellowish

¹ Pilsbry calls *Navarchus*, *Navanax*.

green, bipinnate, free for nearly all its length, and bearing about fourteen primary pinnae. At its anterior end is the large prominent bifid genital papilla. The verge is conical and grooved; the prostate is granulose and T-shaped. The pharynx is a long and narrow tube (31 by 3 mm.), and though thicker than the rest of the digestive tract is not conspicuously muscular as in many other species. It is succeeded by a membranous tube which passes straight into the hepatic mass without any dilatation which can be called a stomach. The greater part of the pharyngeal tube lies under the hepatic mass, which is grooved to receive it, and which approaches within 6 mm. of the mouth. The free portion of the tube, however, contained within this space is bent, and measures 12 mm. I could find no salivary glands. The shell is white, and consists of a solute calcified whorl much in the shape of a comma. To this is attached a plate, the outer part of which is membranous and the inner calcified.

The important characters of this species appear to be the amplitude of the parapodia, shield margins, and posterior processes; the narrowness of the pharynx, and the quasi-pinnate rhinophorial organs.

DORIDIUM PILSBRYI,¹ Eliot.

(Proc. Acad. Nat. Sci. Philad., 1899, p. 512, pl. xix, figs. 1a-b.)

The external characters of this species were described by me from a single living specimen captured in Samoa, and deposited without being dissected in the Museum of the Academy of Natural Sciences at Philadelphia. The animal is of a light tint, varying from pale green to fawn colour, with a pattern on the two dorsal shields roughly resembling a figure 8. This light coloration is unusual, if not unique, in the genus.

The specimen now examined was captured by Mr. Stanley Gardiner at Rotuma, and is small, 24 mm. long and 10 mm. broad. The parapodia are not at all ample, particularly in front; their greatest width is 3 mm. The head-shield is long and narrow (12 × 5 mm.); the edges are not very prominent, and the flap behind small. The hinder shield is 9 × 7 mm., and bears two short processes about 3 mm. long, which are quite simple and do not form a disc. The whole body as preserved is of a pale indistinct fawn colour. On the head-shield a black bar runs down to what may be described as a figure of 8, consisting of three, not two, circles placed one above the other. On the hinder shield is another figure, which may be described as a figure of 8 with the lower circle not closed. A border runs round the parapodia about 2 mm. from the edge, and at fairly regular intervals sends off lines to the edge. On the foot are about ten spots of irregular shape. All these markings are very distinct and of an intense black. In the living specimen which I saw, the gill was dark green; as preserved it is dirty yellow. The digestive tract is much as in the species last described. First comes a long, narrow, non-muscular pharyngeal tube

¹ Since writing the above I have read Professor Bergh's description of the species (Semper's Reisen, iv, iii, 2, pp. 305-6), which in all essential particulars agrees with my observations.

(10 mm. long by 2 mm. wide); then a thinner and more membranous tube (3 mm. long by .5 mm. broad); and then, at the entry of the hepatic mass, a dilatation 5 mm. long and 3 mm. broad. I could not see any folds or plates in any part of this apparatus, but it was not well preserved. The hepatic mass lies on the top of the digestive tract, as in the last species, and is grooved to receive it. The prostate is granulose and T-shaped; the verge elongate and conical: no groove, though doubtless present, could be distinguished on it. The shell is a mere convex plate, as in *Aplysia*, and entirely membranous, without a trace of calcification. But the individual is small and probably immature, so that calcification may perhaps set in later.

DORIDIUM(?) CYANEUM, Von Martens.

I only know Von Martens' description of this species and of *D. nigrum* as they are reproduced in Pilsbry's "Manual of Conchology," vol. xvi. The details given are so few that identification without reference to the original specimens is hardly safe, particularly as my specimens do not show any "numerous anastomosing net-like wrinkles." On the other hand, they come from much the same locality, East Africa, and they exhibit the same remarkable variety of hue, ranging from uniform bluish black to an elaborate coloration analogous to that of Von Martens' var. *vittata*.

Of my specimens captured in Zanzibar (Chuaka and Jembiani), one was of a uniform transparent black with a beautiful purple iridescence, with no markings at all. In another the ground colour was the same, but the various lobes were edged with bright blue blotches. In two others, in addition to these markings two sandy crescent-like spots were present, one on each of the dorsal shields. Of three specimens caught at Jembiani, one had in addition to the vivid blue blotches two long broken lines of orange yellow on the head and sides, besides a few dots of the same colour on the back; a second had in addition numerous irregular greenish blotches. In a third the yellow was greyish and the green blotches smaller and fewer.

In alcohol the largest specimen measures 24 mm. in length and 15 mm. in breadth. The front shield is 14 mm. long, the hind shield 8 mm. The margin of the front shield is fairly ample, but the hind shield is hardly distinguished from the surrounding area. The posterior processes form a disk much as in *D. depictum*. There are no distinct lamellæ or other organs which can be called rhinophores. The gill is large and white. The seminal groove is not white as in many other dark species, but of the same colour as the surrounding parts. The pharynx is colossal compared to the size of the animal (length 12, breadth 15 mm.), but is not very muscular. The shell is of a fair size, a large membranous plate being attached to the calcified part, which latter is 9 mm. long. There appears to be no spire. The prostate is double, or at least deeply bifid; the verge is long and grooved.¹

¹ Since writing the above I have read Professor Bergh's description of the species (Semper's Reisen, iv, iii, 2, pp. 303-5), which in essential points agrees with mine.

DORIDIUM RETICULATUM, n.sp. (Pl. XIII, Fig. 1.)

One specimen from near Wasin Island, E. Africa. The form of the living animal is somewhat elongate. The foot and the sides are of a dull greenish drab, covered by a network of dark-brown round meshes, which become black at the edges of the parapodia. The posterior processes and the front of the foot are edged with black. About the middle of the edge of the epipodia are three large dull blue spots. The network is found also on the two dorsal shields, where it is very fine and close. The general colour is lighter above than below, and the central parts of the anterior shield are of a light pale yellow.

The alcoholic specimen is 12 mm. long and 5.5 mm. broad. The epipodia are narrow and little developed. The same is the case with the margins of the dorsal shields; the head-shield has no flap behind, and the hind shield is merely an area with hardly raised edges. The posterior processes form a sort of disk. The left one is much the larger and broader.

The head-shield is pointed anteriorly, with somewhat indistinct lamellations under the edge. There are no lumps bearing sensory organs about the mouth. The pharynx is of a moderate size, being about 1.5 mm. broad. The shell is strong and calcareous, but almost transparent. The spire is solute, and apparently no part of the structure is membranous.

It is possible that this specimen may be identical with *D. guttatum*, v. Martens, or *D. Giglioli*, Tapp.-Can., but the descriptions of those species are too brief to admit of a certain identification, and I have therefore thought it safer to create a new species.

CHELIDONURA.—Only the following species have been sufficiently examined for their identity to be certain:—

1. *C. hirundinina* (Quoy & Gaimard). Pacific.
2. *C. varians*, Eliot. East Africa.
3. *C. Philinopsis*, Eliot. East Africa.
4. *C. plebeia*, Bergh. Pacific.

CHELIDONURA VARIANS, n.sp.

Five specimens from Chuaka, east coast of Zanzibar. The colour of the living animal is jet black, with brilliant blue edges to the parapodia, dorsal shields, and posterior processes. This blue line is, however, broken in places, and there are some sporadic blue spots, as well as a blue line down the centre of the head-shield. The parts hidden by the parapodia are somewhat lighter than the rest. The length of the alcoholic specimens is about 30 mm., and the breadth rather more than 10 mm. The front shield has a long tapering flap, and its total length is about 18 mm. Its shape varies somewhat. In three of the five specimens it forms a rough isosceles triangle. In one the corners of the anterior margin are produced into tentacle-like expansions, and in another the anterior third of the shield is sharply distinguished from the remaining portion by being 4 mm. broader, but at the same time this broad portion is too large to be described as forming tentacles or rhinophores. The posterior processes are between

4 and 5 mm. long; in one specimen the right is longer, in another the left, in three they are equal. The gill and spermatid groove are white. At the sides of the mouth and under the projections of the anterior shield are numerous bluish-white prominences bearing bristles. They are more numerous than in *C. hirundinina*, and are not grouped symmetrically. The pharynx is not large, 3 mm. wide, and moderately muscular. It is succeeded by a narrow tube, which passes into the hepatic mass without giving rise to any dilatation or stomach. The prostate is granulose and deeply bifid. The verge is large (7 mm.), and the sack in which it is contained ends in a globular expansion. The shell is brown, entirely membranous, and apparently hatchet-shaped.

CHELIDONURA (?) HIRUNDININA, var. PUNCTATA, n. var.
(Pl. XIII, Fig. 2.)

Three specimens from Zanzibar. The living animal, when in an extended condition with the parapodia folded, was about 35 mm. long. The colour is black, with a very thin white line round the parapodia; while all over the body, and even on the under surface, there are large orange spots. The animal is fairly active in its movements, but adheres only slightly. The crawling surface does not appear to be differentiated from the rest of the body in any way.

The measurements of the largest alcoholic specimen are as follows: Length 18 mm., breadth with the parapodia folded 11 mm., with the parapodia fully extended 21 mm., anterior head-shield 9 mm. long, two-thirds of which is formed by a free flap behind; the posterior processes 5 mm. long. The orange spots have become pale blue. The gill is yellowish white and concealed more than usual, being placed in a distinct gill-chamber under and behind the right posterior process. The large parapodia are united in an ample expansion under the two posterior processes, strongly resembling the disposition of the same parts in *Gastropteron*. There are no symmetrically placed prominences round the mouth as in the specimens of *C. hirundinina* examined by Bergh (*Zool. Jahrb.*, Bd. xiii, Syst., p. 214), but merely a number of indistinct and irregularly granulated humps. The pharynx is not very large (2.5 mm. long by 2 mm. broad), but is thick and muscular, and yellow in colour. The shell is unusually thick though brittle, pink, and entirely calcified.

These specimens have not the typical coloration of *C. hirundinina*, but Professor Möbius (as quoted by Pilsbry, *Man. Conch.*, vol. xvi, p. 35) found an individual which was "bluish-black with yellow spots . . . the reflexed foot margins on the back having a narrow clear green edge." This is clearly the same animal as my specimens, and in view of the tendency displayed by all the Doridiidae to vary in shape and coloration it is safer to regard it provisionally as a variety. I am not sure, however, that the position of the gill and the arrangement of the sense organs round the mouth do not constitute specific characters.

CHELIDONURA PHILINOPSIS, n.sp.

One specimen from Chuaka, Zanzibar. The general colour of the

